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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,992	09/26/2003	Hardayal Singh Gill	HITG.034PA(0591)	1083

62630 7590 03/23/2007  
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CHATTANOOGA, TN 37402

EXAMINER
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RENNER, CRAIG A

ART UNIT	PAPER NUMBER
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2627

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

03/23/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

**Application No.**

10/672,992

**Applicant(s)**

GILL, HARDAYAL SINGH

**Examiner**

Craig A. Renner

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-50 is/are pending in the application.
- 4a) Of the above claim(s) 1-17, 24-33 and 40-49 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18, 34 and 50 is/are rejected.
- 7) ☒ Claim(s) 19-23 and 35-39 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 January 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Claims 1-17 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to one or more non-elected inventions/species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 17 April 2006.
2. Claims 24-33 and 40-49 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to one or more non-elected inventions/species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 02 August 2006.

### *Drawings*

3. The drawings were received on 11 January 2007. These drawings are accepted.

### *Specification*

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following is suggested:  
--DIFFERENTIAL GMR SENSOR WITH MULTI-LAYER BIAS STRUCTURE BETWEEN  
FREE LAYERS OF FIRST AND SECOND SELF-PINNED GMR SENSORS--.

5. The disclosure is objected to because of the following informalities:

- a. In line 1 on page 23, "air bear surface" should be corrected to read --air bearing surface--.
- b. In line 14 of the replaced paragraph beginning in line 6 on page 24, "a first free layer an interlayer" should be corrected to read --a first free layer, an interlayer--.
- c. In line 1 of claim 24, "the four NiFe" should be changed to --the four NiFe layers-- in order to more clearly refer back to that set forth in line 2 of base claim 21.
- d. In line 2 of claim 38, "the four NiFe" should be changed to --the four NiFe layers-- in order to more clearly refer back to that set forth in line 2 of base claim 37.

Appropriate correction is required.

6. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 18, 34 and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Beach et al. (US 6,449,134).

With respect to claim 18, Beach teaches a differential GMR sensor (400) comprising a first self-pinned GMR sensor (includes layers 402, 302, 208 and 222, for instance) having a first pinned layer (302), a first spacer layer (208) and a first free layer (222); a second self-pinned GMR sensor (includes layers 404, 304, 210 and 224, for instance) having a second pinned layer (304), a second spacer layer (210) and a second free layer (224); and a bias structure (220) disposed between the first free layer of the first self-pinned GMR sensor and the second free layer of the second self-pinned GMR sensor (as shown in FIG. 14, for instance), wherein the bias structure is configured to provide antiparallel magnetizations (226 and 228) for the first and second free layers without using an antiferromagnetic layer (as shown in FIG. 14, for instance).

With respect to claim 34, Beach teaches a magnetic disk recording system (30) comprising a magnetic storage medium (34) having a plurality of tracks for recording of data; and a magnetic transducer (40) maintained in a closely spaced position relative to the magnetic storage medium during relative motion between the magnetic transducer and the magnetic storage medium, the magnetic transducer including a magnetoresistive read sensor (400), the magnetoresistive read sensor further comprising a first self-pinned GMR sensor (includes layers 402, 302, 208 and 222, for instance) having a first pinned layer (302), a first spacer layer (208) and a first free layer (222); a second self-pinned GMR sensor (includes layers 404, 304, 210 and 224, for instance) having a second pinned layer (304), a second spacer layer (210) and a

second free layer (224); and a bias structure (220) disposed between the first free layer of the first self-pinned GMR sensor and the second free layer of the second self-pinned GMR sensor (as shown in FIG. 14, for instance), wherein the bias structure is configured to provide antiparallel magnetizations (226 and 228) for the first and second free layers without using an antiferromagnetic layer (as shown in FIG. 14, for instance).

With respect to claim 50, Beach teaches a differential GMR sensor (400) comprising first self-pinned means (includes layers 402, 302, 208 and 222, for instance) having a first pinned layer (302), a first spacer layer (208) and a first free layer (222); second self-pinned means (includes layers 404, 304, 210 and 224, for instance) having a second pinned layer (304), a second spacer layer (210) and a second free layer (224); and means (includes 220, for instance, in at least an equivalent structural sense), disposed between the first free layer of the first self-pinned means and the second free layer of the second self-pinned means, for biasing the first and second free layers of the first and second self-pinned means to provide antiparallel magnetizations for the first and second free layers without using an antiferromagnetic layer (as shown in FIG. 14, for instance).

#### ***Pertinent Prior Art***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. This includes Hasegawa (US 2004/0012898), Hasegawa et al. (US 2004/0086751), Saito et al. (US 2004/0218311), and Hasegawa (JP 2000-215421), which each individually teaches a differential GMR sensor comprising a bias structure

disposed between free layers of first and second self-pinned GMR sensors, wherein the bias structure is configured to provide antiparallel magnetizations for the free layers without using an antiferromagnetic layer.

***Allowable Subject Matter***

10. Claims 19-23 and 35-39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

11. Applicant's arguments filed 11 January 2007 have been fully considered but they are not persuasive.

The applicant argues that "the claims, as amended, recite a first self-pinned GMR sensor, a second self-pinned GMR sensor. The dual spin valve sensor of Beach et al. provides AFM pinned layers rather than self-pinned layers." This argument, however, is not found to be persuasive because the term "self-pinned" does not necessarily exclude the presence of an antiferromagnetic layer in the GMR sensor itself. That is, the GMR sensor is self-pinned by its own antiferromagnetic layer.

The applicant further contends that "Beach et al. do not disclose a bias structure configured to provide antiparallel magnetizations for the first and second free layers without using an antiferromagnetic layer." This argument, however, is not found to be persuasive as Beach et al. do disclose a bias structure (220) configured to provide

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antiparallel magnetizations (226 and 228) for first and second free layers (222 and 224) without using an antiferromagnetic layer (as shown in FIG. 14, for instance). The ruthenium antiparallel coupling layer (220) of Beach et al. provides biasing to at least some extent as do applicant's ruthenium antiparallel coupling layers and therefore may be considered a bias structure.

### ***Conclusion***

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig A. Renner whose telephone number is (571) 272-7580. The examiner can normally be reached on Tuesday-Friday 9:00 AM - 7:30 PM.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T. Nguyen can be reached on (571) 272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Craig A. Renner  
Primary Examiner  
Art Unit 2627

CAR